CLAIMS

1. An apparatus comprising:

means for receiving an (x,y) coordinate of a modulated signal;

means for determining a first value according to the equation $-2x(\hat{I}_i-\hat{I}_j)$, wherein $\hat{I}_i$ is the I component of a first symbol closest to the (x,y) coordinate and $\hat{I}_j$ is the I component of a second symbol closest to the (x,y) coordinate with a bit value opposite of the corresponding bit value of the first symbol;

means for determining a second value according to the equation $2y(\hat{Q}_i-\hat{Q}_j)$, wherein $\hat{Q}_i$ is the Q component of the first symbol and $\hat{Q}_j$ is the Q component of the second symbol;

means for determining a third value equivalent to the sum of $A_0(\hat{I}_i^2+\hat{Q}_i^2)$ and $-A_0(\hat{I}_j^2+\hat{Q}_j^2)$, wherein A_0 is the minimum amplitude;

means for determining a log-likelihood ratio (LLR) as a sum of the first value, the second value, and the third value; and

means for transmitting the LLR to a decoder.

2. The apparatus of Claim 1, further comprising means for storing the value of at least one of $2(|\hat{I}_i-\hat{I}_j|)$, $2(|\hat{Q}_i-\hat{Q}_j)$, $A_0(\hat{I}_i^2+\hat{Q}_i^2)$, $-A_0(\hat{I}_j^2+\hat{Q}_j^2)$, the sign of $2x(\hat{I}_i-\hat{I}_j)$, and the sign of $2y(\hat{Q}_i-\hat{Q}_j)$ is stored in memory.

3. The apparatus of Claim 1, wherein the means for determining the first value comprises an adder and a sign inverter connected to the adder.

4. The apparatus of Claim 1, wherein the means for determining the second value comprises an adder and a sign inverter connected to the adder.

5. An method for determining the log-likelihood ratio, the method comprising the steps of:

receiving an (x,y) coordinate of a received signal;

determining a first value according to the equation $-2x(\hat{I}_i-\hat{I}_j)$, wherein $\hat{I}_i$ is the I component of a first symbol closest to the (x,y) coordinate and $\hat{I}_j$ is the I component of a second symbol closest to the (x,y) coordinate with a bit value opposite of the corresponding bit value of the first symbol;

determining a second value according to the equation $2y(\hat{Q}_i-\hat{Q}_j)$, wherein $\hat{Q}_i$ is the Q component of the first symbol and $\hat{Q}_j$ is the Q component of the second symbol;

determining a third value equivalent to the sum of $A_0(\hat{I}_i^2+\hat{Q}_i^2)$ and $-A_0(\hat{I}_j^2+\hat{Q}_j^2)$, wherein A_0 is the minimum amplitude; and

determining a log-likelihood ratio as the sum of the first value, the second value, and the third value.